mercial & Sugar Co.'s mill at Spreckelsville. The plowing of the land is performed by the aid of Fowler's steam tackle to a depth of sixteen inches. The cultivation of the soil consists of fertilization and irrigation.

Contrary to the practice upon most plantations, the stripping of the cane is dispensed with, as it is considered by the management a useless expense. The crop for 1901, according to the annual report of the manager, amounts to 800 acres, including forty acres of rattoons. At the time the report was rendered it was estimated that the yield of sugar from the above area would be from five to six tons per acre, which estimate will be somewhat reduced, due solely to conditions that always exist upon new plantations.

The 1902 crop will be from 800 acres of plant and 500 acres of rattoons, while the 1903 crop is estimated at 800 acres of plant and 600 acres of rattoons. As rapidly as the existing conditions will permit, the placing of the land in shape for planting is being proceeded with.

The company is now employing 650 laborers, about 50 per cent of the labor upon the plantation being carried out under contracts, such as rocking the fields, development of water and water supply, preparing land for planting, ditch construction, cutting and loading cane on cars and the discharging of vessels containing coal and other supplies for the plantation.

As the rainfall is so uncertain and limited in quantity, irrigation is the only recourse in this section of Maui, and to secure a sufficient supply a number of wells have been sunk to water level, which is approximately 300 feet. Three pumping stations have been established upon the plantation and designated as Nos. 1, 2 and 3, the three wells jointly having a pumping capacity equal to 31,000,000 gallons in twenty-four hours, while the present estimated available supply for the pumping systems is 25,000,000 gallons in twenty-four hours.

At station No. 3, which is the most important pumping plant, a shaft has been sunk to a depth of 300 feet, at the bottom of which has been developed a large body of water. Here has been excavated an immense chamber out of the solid rock, in which has been installed a Risdon pump capable of lifting 7,500,000 gallons of water in a single lift of 450 feet. There is now being installed in a separate concrete chamber a Reidler pump having a capacity for lifting 10,000,000 gallons to a height of 350 feet in twenty-four hours.

Power to drive this labyrinth of machinery is developed at the collar of the shaft by the aid of three Heine patent safety water tube boilers of 250 horsepower each and a Sederholm boiler of 350 horsepower.

Five immense dirt reservoirs having a joint capacity for storing 80,000,000 gallons of water are now in course of completion, three of which are in use. All these reservoirs are riprapped on the inside to withstand any unusual disturbance of the water. Several pipe lines have already been laid from the pumping plants to the completed reservoirs, from whence water is drawn and distributed to the various cane fields by main waterways and flumes capable of carrying large volumes of water.

In the distribution of water for irrigation purposes the manager has hit upon a practical manner of applying nitrate of soda to the soil, which greatly stimulates the growth of the cane. What has been applied to the land through the irrigation water was at the rate of 100 pounds to the acre, one week out of every three, but this application has been changed to fifty pounds every two weeks. The application of nitrate of soda to cane lands is not a new one, but the method of application on the above lands is a new departure.

Cane planted in February and March of this year shows a remarkable growth, some of which is as high as a man's head when on horseback. Under an agreement with the Hawaiian Commercial & Sugar Co., Haiku and Paia plantations, all their surplus water is diverted onto the lands of the Kihei plantation. Throughout the property some ten miles of dirt roads giving access to the various plantation cane fields are completed, while eight miles of railroad, including switches, greatly expedite the moving of material and transportation of the cane product to the mill. The system is equipped with 250 freight cars and supplied with two engines, the larger one weighing fifteen tons. At Kihei the company conducts its own store, own wharves, lighters, buoys, moorings, etc., while the capacity of the lighters is eighty tons per day. Coal for the plantation is shipped direct from Newcastle. Everything has been constructed with an idea for the future, so that when the greater area of land is under cultivation the mechanical appliances now on the property will be able to perform any demands that may be placed upon them.

W. F. Pogue has been manager of the Kihei Plantation Company ever since its formation, and has been identified with the sugar industry of the Island for the past twenty-five years and in a practical way for the past eight years.

Following are the officers and directors of the Kihei Plantation:

H. P. Baldwin, President.
E. E. Paxton, Vice President.
J. P. Cooke, Treasurer.
L. A. Thurston, Secretary.
J. B. Castle, Auditor.

The sugar output of the Island of Maui will be greatly augmented for the 1902 crop, as the recent rains will greatly stimulate the growth of cane, which in places is looking exceptionally well.

The total production of sugar on the Island of Maui for the year 1901, according to the report of the Hawaiian Planters' Association, was 58,349 tons.

Hawaiian Commercial & Sugar Co.

The Hawaiian Commercial and Sugar Company's plantation is situated on the island of Maui on a broad plain of land located between the Haleakala mountain and the West Maui mountain, and extends from Kahului bay on one side of the island to Maalaea bay on the other side.

The plantation owns over 30,000 acres of land, of which about 20,000 acres is first-class cane land.

Claus Spreckels of San Francisco first started this plantation in 1877, and held the controlling interest until about the year 1895.

The control of the plantation is now held by other parties, W. J. Lowrie being manager of the estate.

The present owners of the plantation have made great progress towards developing the resources of this large estate.

Water Supply.—The water supply of the plantation for irrigation purposes consists of three large irrigation aqueducts—the Haiku ditch, capacity 50,000,000 gallons in 24 hours; the Lowrie ditch, capacity 65,000,000 gallons in 24 hours; the Waihee ditch, capacity 50,000,000 gallons in 24 hours; total, 165,000,000 gallons in twenty-four hours.

The so-called Haiku and Lowrie ditches above mentioned are over twenty-five miles long and conduct water from the streams along the slope of the Haleakala mountain.

The Waihee ditch conducts water from the Waihee valley on West Maui.

The plantation also has six pumping plants, total capacity 42,000,000 gallons per twenty-four hours. The plantation has reservoirs for storing 701,500,000 gallons of water. In a few months additional reservoirs will be constructed for storing 450,000,000 gallons. An additional pumping plant will be installed that will furnish 10,000,000 gallons of water in twenty-four hours.

Cane Crop.—This year's crop of cane, which has not all been milled yet, will probably reach 27,000 tons of sugar.

The plantation has under cultivation at the present time, the balance of the crop of 1901 now being milled, the crop of 1902, and a portion of the crop of 1903, which is now being planted—a total acreage aggregating about 7500 acres.

Transportation.—Cane is transported from the fields to the sugar factory by rail. A well-constructed railroad system has been laid to all parts of the plantation, and four locomotives are in constant use.

Sugar Factory.—The capacity of the present sugar factory is about 150 tons of sugar in twenty-four hours. The factory, located about one and one-half miles from one end of the plantation and about nine miles from the other, is in a very inconvenient location, especially for taking off the large crops it is proposed to raise. Portions of the machinery are old-fashioned and worn out.

The directors of the Hawaiian Commercial and Sugar Company decided to erect a new sugar factory to be called "The Puunene Mill." This immense undertaking is designed to replace the factory now in operation at Spreckelsville, which is not large enough to handle the crops projected for the immediate future by the directors of the Hawaiian Commercial and Sugar Company.

The new works are situated near the center of the cane lands, about a mile and a half directly inland from Kahului, and although this involves building a small town with its sewerage, water, lighting and railroad systems in addition to the sugar factory, there are so many advantages to be gained that the expenditure is fully warranted.

In the new location the factory is practically central, and the average haul of the cane from the fields to the mills is much reduced, and as the daily delivery of cane will reach in the near future some 3600 tons, the value of the short average haul is at once seen.

The factory is so situated that the water used in the condensers during the processes of manufacture, amounting to some nine (9) million gallons every twenty-four hours, is available for irrigating purposes on the land lying below the factory, these waste waters from the mill carrying off most of the by-products which are valuable as fertilizers, which are thus deposited in the furrows under the most favorable circumstances and in the cheapest possible manner.

At the old mill all the water and by-products are run into the sea and are consequently lost to the plantation.

As the new works are at an elevation of about seventy feet above sea level, it is possible to run the finished sugar in bags down to Kahului by gravity, a locomotive returning the empty cars to the factory. This will greatly relieve the work on the locomotives, when it is considered that 8000 bags will be, eventually, a day's output.

The factory itself is of colossal dimensions, covering a space of about 400 feet square, and reaching up 100 feet to the level of the lookout tower or the cupola.

The structure is of steel columns and girders, covered with corrugated sheet iron on sides and roofs; the foundations are of concrete, and as the underlying stratum at the point of location is a hard pan on basalt rock, the underpinning of the building is of a most permanent nature.

For the first two or three crops the machinery will consist of two sets of nine-roller milling plants fitted with Krajewski crushers in front of the mills; each plant will be driven by its own engine of the Corliss type; provision is allowed for the placing of a third crushing plant at a later date.

The refuse from the cane is elevated to a point over the boilers, and is automatically conveyed and distributed to the different furnaces.

Steam will be furnished by fourteen 300-horsepower boilers of the multitubular type set in brick-work with provision for six more boilers when it is required to increase the plant. These boilers are set in two rows facing each other, each row being served by a gigantic smokestack 180 feet high above the grate bars, and twelve feet six inches diameter outside. These stacks are made of steel plates riveted together, and are set on massive concrete piers, so that they are self-supporting. They form a prominent feature of the Maui landscape.

The clarifying apparatus is of the common type in use in these islands, but after clarification the juice will pass through sand filters, which are now being used with much success.

There are two quadruple effect evaporators of the Lillie type, each of capacity to concentrate 500,000 gallons of mill juice per day. This apparatus is of the latest design, and fitted with the most improved pumps, etc.

For boiling the syrup there are four vacuum pans with provision for two more. Each pan can throw out ninety (90) tons of dry sugar per twenty-four hours. For treating the low grades or molasses sugars, there are twelve crystallizers, each of capacity to hold one strike of molasses from the above pans. By the use of these crystallizers all the available sugar in the molasses resulting from the drying of the No. 1 sugar, is secured in one boiling, and in a closed apparatus, which is much more cleanly and expeditious, and consequently cheaper, than the usual cumbrous and dirty method of open coolers.

For drying the first and second sugars there are provided sixteen 40-inch Weston water-driven centrifugal machines of the newest and most improved type. Provision is made for eight more machines, making twenty-four in all, when the factory is made up to full capacity.

After drying, the sugars are elevated automatically into a bagging bin capable of holding ninety tons of sugar. In this bin the sugars are scattered and cooled, and then bagged, the sugar running out of spouts into the bags, which are then weighed and the bags sewed up. The operation of bagging the sugar is far more economical by this method of handling than by the usual means of shovelling.

The sugar-packing room has capacity for some 20,000 bags of sugar and opens directly to a loading platform, where eight cars can be loaded at the same time.

On top of the building, about 100 feet from the ground, there is a lookout tower, where a watchman and telephone will be stationed to give prompt advice of fires or other untoward occurrences.

The view from the lookout is very extensive, covering the whole of the Hawaiian Commercial and Sugar Company's lands and a great part of Hamakuapoko, Paia and Kihei, and also most of the Wailuku cane fields.

As there is nothing more dreaded than fire in the cane fields, early warning of its occurrence and locality is of great value.

This sugar works when complete will have a capacity of between 500 and 600 tons of raw sugar every twenty-four hours, which places it so far ahead of any other establishment of the kind at the present day that there may be said to be no second to it.

Active work commenced on the foundation in August, 1900, and on the building and machinery in January, 1901. It is expected the new factory will be ready to commence grinding in January, 1902.

The works were designed by the Honolulu Iron Works Company of Honolulu, which company acts as consulting engineers to the Hawaiian Commercial and Sugar Company, and the work of erection is proceeding under their supervision.

The structural materials and men for erecting same were furnished by Milliken Brothers of New York. The machinery came from various sources: mills and boilers, Honolulu Iron Works Company; carriers and conveyors, Link Belt Company, Chicago; vacuum pans and crystallizers, Kilby Manufacturing Company, Cleveland; quadruple effects, Sugar Apparatus Company, Philadelphia; centrifugal machines, American Tool and Machine Works, Boston; pump, George F. Blake Company, and Guild & Garrison, and is all of the latest design and most improved construction.

Following are the officers and directors of the Hawaiian Commercial and Sugar Company:

H. P. Baldwin, President.
Albert Meyer, Vice President.
George M. Rolph, Secretary.
Directors—S. T. Alexander, Edward Pollitz, W. M. Alexander.

Cane Car Sheds, New Mill, Hawaiian Commercial & Sugar Co.'s Estate, Spreckelsville, Maui

Partial View New Mill Hawaiian Commercial & Sugar Co., Spreckelsville, Maui

Pioneer Mill Co.

Among the many plantations on the Island of Maui the Pioneer Mill Company, Limited, is an important one, not only as regards the large area of land owned and controlled by the company, but the large percentage of area which is adapted to the successful culture of sugar cane. The property comprises 25,000 acres of land situated in the Lahaina and Kaanapali districts. Of this area about 4000 acres are under cane, fully one-third of which acreage is plant cane, the remainder being rattoons.

The character of the soil is a red alluvial of volcanic nature, while the greatest elevation that cane is planted is 1000 feet, the entire acreage being planted to the Lahaina variety of cane. In the plowing of the soil two sets of Fowler's steam tackle and ordinary mule plows are in use, but the greatest part of the land is worked by pick and shovel. All the mauka stony land in Kaanapali district is mostly worked with steam plows.

Method of Unloading Cane at New Mill of Hawaiian Commercial & Sugar Co., Spreckelsville, Maui